List of concerns

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Cc: Michael Overbay, Jose Torres, Stacey Dwyer, Philip Dellinger

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David,

Here's the list of concerns I have. That is not to say I will not develop more if additional information is gathered.

I see four areas of concern discussed below.

Wells to the SE.

UEC is claiming the exemption meets the current use criterion for the SE wells of concern based on 2 assertions:
1) vertical confinement provided by the laterally extensive clay confining layers and
2) the direction of ground water flow which they say precludes the SE water wells' opportunity to capture water from the exemption.

I agree with their assertion concerning the laterally extensive clay layers. We have numerous cross-sections that indicate such. However, these same cross-sections also show that the lateral continuity of the clay layers are significantly disrupted by the two faults forming the graben within which the ore body lays. Both of these faults could be vertically transmissive.

For me this is mostly a concern at the SE wells which are in close proximity to the SE fault and possibly down gradient. A pump test at/near the Church wells would provide data to address three concerns 1) it would provide some basis for finding vertical isolation exists, **if** that is what it reveals, 2) if it did reveal isolation then we also have a basis to eliminate concerns for any artificial penetrations nearby that might communicate and 3) we could confirm the true total depths of the Church wells and 4) we could learn the fluid levels of all wells involved in the test and in so doing get some sort of idea of the gradient at the Church wells. We have little to no documentation on the construction of the Church wells beyond hearsay. The pavilion well is thought to be completed in the B sand (120'-140'). We could confirm that assertion when rigging up the well in preparation of the pump test. If the pavilion well is completed in the B sand then the direction of GW flow (UEC's second contention) at that well becomes more important as the pavilion well would be in hydraulic communication with the B sand ore body.

These concerns are slightly shifted in priority on the Braquet well due to it's spatial location relative to the ore bodies and to the SE fault. Because it is completed in the A but closer to the B sand ore body it is more critical to have evidence of isolation from the B sand. Conversely, its greater distance from the SE fault puts it at less risk from vertical migration from the B sand through the fault.

The direction of GW flow will dictate the direction of GW capture and thus far, UEC has only provided evidence for GW flow in the A and B sands within the monitor well ring within the exemption. Without the benefit of measurements at and in proximity to the wells of concern, which lay outside the exemption, EPA would have to assert that the GW flow retains its easterly direction at the Church wells. I think it reasonable and practical for geologists to review data and assert findings for a small distance but this distance I judge is too great for EPA to accept in lieu of more appropriate data. In addition to the "distance

factor", the SE fault can raise an additional challenge. The NW fault is believed to be the reason for the change in direction and rate of the regional GW flow in the graben from SE to east. Our own contour maps, those that show the NW fault, indicate such. In addition, all of the cross-sections indicate that the degree of slip at the fault, to a large extent aligns clay layers to sands which could act to restrict normal flow. Given these observations, it stands to reason that the very similar fault to the SE, which is very close to the wells of concern, would also impact GW flow direction and rate. These factors cause me to assert that the prudent course of action for EPA would be to measure directly rather than assert findings from a distance for such a critical decision.

Wells to the NW

UEC has provided rudimentary calculations to show the capture zones for a hypothetical well, similar to those wells to the NW, would not reach into the exempted zone. UEC seems to have taken a reasonable approach in gathering the data that comprises most of the factors used in calculating the extent of the capture zone. However how that capture zone is oriented makes all the difference. With respect to the calculation I would have preferred a more robust examination but those calculations, plus what we know of the regional gradient, does provide us with some reasonable basis for decision. UEC asserts the capture zone grows directly into the regional flow direction which would be out of the NW. Under typical conditions that is a valid assumption. We do have the NW fault that is disruptive to the regional GW flow but it is reasonable to assert such a claim, with no data to support or refute their assertion. In other words, it is likely that the NW fault is too far down gradient to sufficiently impact the direction of flow at the wells of concern. And as such, it is reasonable to assert, given the lack of data, that the regional GW flow rate and direction is sufficient to keep the down gradient capture zone of these wells from reaching the exempted zone. Therefore my concerns are lower in the NW region.

Artificial penetrations

APs could have an impact on EPAs findings that UEC's assertions that the existing wells are sufficiently isolated to meet the current use criterion. There are numerous APs in all directions with unknown confinement capacity. I had originally suggested that the pump test submitted reflected a potentially self sealing capacity to the shallow loosely consolidated clays and sands that make up the Goliad. This may still be the case but I retract my earlier suggestion that the pump tests supported that contention. After going back and reviewing the pump tests submitted the areal spacing of the overhead monitor wells (OMWs) utilized and reported in the test did not adequately cover the areal extent inside the ring. All of those reported exist on the eastern region of the B sand. There are several OMWs in the western region of the B sand but their results were not reported and I wonder why. Therefore the pump test over the B sand is not sufficient to support the self sealing theory in my opinion.
The proposed exemption boundaries

Exemption boundaries

Lastly the proposed exemption boundaries show that a portion of the monitor well ring over the B sand overlays the exemption boundary in the SE. Monitor wells are supposed to be positioned such as to allow detection of an excursion with enough time to reverse the flow regime before the mining fluids reach the non-exempted USDW. As currently proposed, the identified monitoring wells could only detect fluids moving into a USDW, a violation of the SDWA. I understand that TCEQ requires a maximum 400' spacing between monitoring wells and those wells be located a minimum 400' from the exemption boundary. I don't know if that is rule or guidance. I do know the federal program provides no requirements for monitor wells at uranium mines.

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